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Occurrence of a New Anophthalmic Trechine Beetle in the  
Lava Caves of the Aso Volcanoes, Southwest Japan<sup>\*,\*\*</sup>

*With 3 Text-figures*

Shun-Ichi UÉNO

*Department of Zoology, National Science Museum (Nat. Hist.), Tokyo 160, Japan*

**ABSTRACT** A new anophthalmic trechine beetle belonging to the *gracillimus* group of the genus *Rakantrechus* is described from two lava caves of the Aso Volcanoes in central Kyushu, Southwest Japan. It is very closely allied to *R. tofaceus* S. Uéno of Fusé-dô Cave, lying in a tuff formation to the south of the volcanoes, but is distinguished from that species mainly by the degeneration of elytral striae and by the absence of copulatory piece. The name *R. asonis* is herewith proposed for the new species.

In the present paper, I am once more going to describe a troglobiontic trechine beetle that dwells in lava caves of Japan. Six species of those trechines have already been reported from three different lava areas of the Japanese Islands, that is, the Fuji-Izu area in central Honshu, the Islet of Daikon-jima in western Honshu, and the Tomié area of the Island of Fukué-jima off the western coast of Kyushu. They are distributed to five different genera, *Trechiamma*, *Kurasawatrechus*, *Stygiotrechus*, *Daiconotrechus* and *Gotoblemus* (Uéno, 1960, 1970 b, 1971 a, 1971 b, 1972 a, 1974), of which the last two have so far been known only from lava caves. The species to be reported in this paper belongs to another genus, *Rakantrechus*, more precisely to the *gracillimus* group of the subgenus *Paratrechiamma* (cf. Uéno, 1970 a, pp. 101–115). It was found in two lava caves of the Aso Volcanoes in central Kyushu, just to the north of the hitherto known range of distribution of the species-group. Unfortunately, no exact data are available as to the date of eruption of the lava flow, in which lie the caves in question. However, it is certain that the lava is not very old, having originated sometime in the Postglacial Age, possibly five or six thousand years ago.

The discovery of this new species is important in two respects. First, it was made in young caves lying in the central part of the Aso Volcanoes, which is still

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active at the present time. This means that the endogean ancestor of the beetle must have reached there in a very recent period by crossing deep valleys separating the central part of Aso from the surrounding mountains. Because of the endogean nature, it seems to have had only limited ability to get over various physical barriers. Although it is difficult to ascertain the means of immigration, the invasion must have successfully been made not only by the ancestral trechine but by various groups of animals, since the caves are colonized also by spiders, millepede and some other troglobionts (all unpublished). Secondly, those caves are situated at the centre of the Aso volcanic area, which has hitherto been regarded as sterile so far as the cave fauna is concerned. This area, extending from west to east across central Kyushu, was previously considered to have constituted a barrier separating the cave fauna of northern Kyushu from that of central Kyushu south of the volcanic area. In fact, these faunas are radically different from each other; the former bears a close relationship to that of the Chûgoku District in western Honshu, while the latter to that of Shikoku, and exceptions to this rule are very scarce though rarely occurring. For instance, the anophthalmic trechine fauna of northern Kyushu consists of the two genera, *Trechiana* and *Stygiotrechus* (cf. Uéno, 1969, 1972 b), whereas that of central Kyushu consists of the entirely different two genera, *Rakantrechus* and *Allotrechiana* (cf. Uéno, 1970 a).

However, a new light has been thrown by the present discovery on the zoogeography of cave animals in the Island of Kyushu. Although the main pattern of their distribution may have been formed in the late Tertiary, subsequent dispersal of their ancestors seems to have disturbed the original pattern to some extent. The Aso volcanic area, which doubtless formed an effective barrier in a remote past, has not been impenetrable even for the ancestors of highly specialized cavernicoles. To our present knowledge, all the troglobiontic animals found in the Aso lava caves are of southern origin, that is, they are closely related to their congeners occurring in the limestone area of central Kyushu. It is of particular interest to see if they have spread farther north across the volcanic area into some parts of northern Kyushu.

*Rakantrechus (Paratrechiana) asonis* S. Uéno, sp. nov.

(Figs. 1-3)

Length: 3.30-3.90 mm (from apical margin of clypeus to apices of elytra).

Very closely allied to *R. tofaceus* S. Uéno (1970 a, pp. 102, 106, fig. 9) and similar to the latter even in the general shape of male genitalia. It is, however, distinguished from the tuff cave species by being smaller on an average, by having a little shorter pronotum, much shallower striae on elytra and shorter apical lobe of aedeagus, and above all by the absence of copulatory piece.

Head as in *R. tofaceus*, though the antennae are somewhat shorter, reaching or extending a little beyond basal four-sevenths of elytra in ♂ and reaching the middle

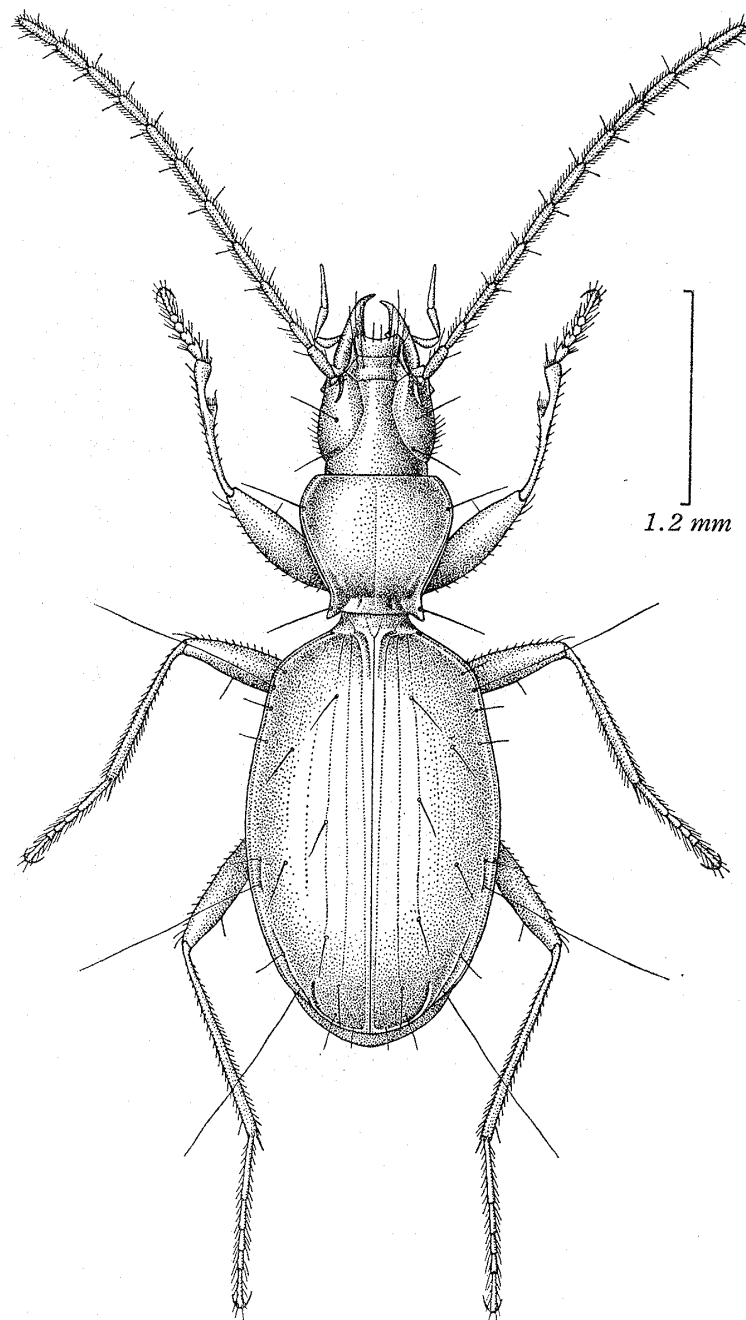


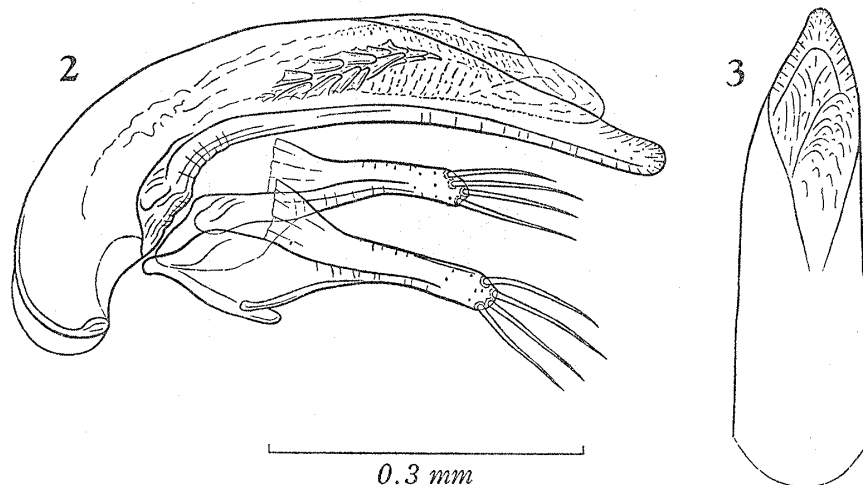
Fig. 1. *Rakantrechus (Paratrechiamia) asonis* S. Uéno, sp. nov., ♂, of Kasaishi-no-ana Cave in the Aso Volcanoes.

of elytra in ♀. Pronotum shorter than in *R. tofaceus* on an average and more rapidly contracted posteriad, widest at about five-sevenths from base or a little before that level; PW/HW<sup>1)</sup> 1.25–1.30 (M 1.27), PW/PL 1.08–1.19 (M 1.12),

1) For abbreviations, see Uéno (1970 a, p. 93).

PW/PA 1.37–1.41 (M 1.39), PW/PB 1.52–1.60 (M 1.56), PA/PB 1.09–1.15 (M 1.12); sides more regularly arcuate in front than in *R. tofaceus*, sinuate around basal one-sixth, with hind angles usually less acute and less protruding than in *R. tofaceus*. Elytra less elongate on an average and less convex than those in *R. tofaceus*, with less salient shoulders and a little more oblique prehumeral borders; EW/PW 1.55–1.70 (M 1.61), EL/EW 1.48–1.64 (M 1.57); striae much shallower than in *R. tofaceus*, disappearing at the side, four inner striae almost entire, finely punctate and more or less deepening near base, 5 also becoming deeper near base but obsolete towards apex, 6–7 usually obliterated though rarely traceable, 8 deeply impressed behind the middle group of marginal umbilicate pores; intervals flat even near suture; stria 3 with three setiferous dorsal pores at 1/7–1/6, 2/5–4/9 and 7/10–7/9 from base respectively; stria 5 with two setiferous dorsal pores at 1/4–2/7 and 5/9–3/5 from base respectively. Other external characters as in *R. tofaceus*.

Male genital organ similar in general appearance to that of *R. tofaceus*. Aedeagus about three-tenths as long as elytra, with the apical lobe shorter than in *R. tofaceus*. Inner sac with a group of large, heavily sclerotized teeth at the left side around middle, and also with a small group of teeth at the right ventral side of the large group; copulatory piece absent. Each style normally with four apical setae (sometimes five setae present on one style).



Figs. 2–3. *Rakantrechus (Paratrechiamia) asonis* S. Uéno, sp. nov., of Kasaishi-no-ana Cave in the Aso Volcanoes. — 2. Male genitalia, left lateral view. — 3. Apical part of aedeagus, dorsal view.

*Type-series.* Holotype: ♂, Kômorî-ana Cave, 4-V-1973, S. Uéno leg. Allotype: ♀, Kômorî-ana Cave, 4-IV-1973, T. Irie & S. Arai leg. Paratypes: 2 ♂♂, Kômorî-ana Cave, 4-IV-1973, T. Irie & S. Arai leg.; 1 ♂, Kômorî-ana Cave, 4-V-1973, S. Arai leg.; 3 ♂♂, Kasaishi-no-ana Cave, 11-III-1973, T. Irie & S. Arai leg. All deposited in the collection of the National Science Museum, Tokyo.

*Localities.* Lava caves called "Kômorî-ana" (type-locality!) and "Kasaishi-no-ana", on the northwestern slope of the Aso Volcanoes, at Nagakusa of Aso-chô in Kumamoto Prefecture, central Kyushu, Japan.

*Notes.* This new species is so closely similar to *R. tofaceus* that it could be regarded as a subspecies of the latter, were it not for the genitalic difference between the two. In the tuff cave form, a copulatory piece is present, though it is still at the beginning of differentiation and for a large part remains membranous. In the lava cave form, there is as yet no indication of a copulatory piece. The difference is not so large, as it represents two different stages in a single line of differentiation. However, we do not know what extent of genitalic differentiation is sufficient to cause reproductive isolation in trechine beetles. Our classification should be usually based upon morphological features alone. In view of the taxonomic importance of male genitalia, I prefer to regard these forms as two full species, at least for the time being. In any case, they have doubtless been derived from a common ancestor, and the history of their differentiation cannot be very long.

The two lava caves, Kasaishi-no-ana and Kômorî-ana, seem to be the upper and lower parts of the same cave system which was divided by a roof collapse. They are developed in a lava flow spouted from the parasitic cone called Komé-zuka. Their entrances are open in a meadow at an elevation of about 730 m, and are difficult to find out without a guide. The upper one is a small pit, from whose bottom the cave gradually descends to near the upper end of Kômorî-ana Cave. Specialized animals, including the present trechine, are localized near the bottom of the entrance pit, which is muddy and eutrophic. The lower one, Kômorî-ana, is larger than the upper, and is entered from a sink covered with a shrubbery. The cave itself is simple, gradually descending to a dead end. The floor is largely composed of block lava but is partly muddy. The trechine beetle is always found in the dark zone near the lower end of the cave. It is active when disturbed and readily takes refuge in fissures of lava blocks.

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